STAR Simulations on the CRAY T3E at NERSC*

J. Yang† D. Olson‡

The basic method of deriving physics results in experimental relativistic heavy ion collisions is to carry out statistical analysis of large numbers of events (collisions of individual atomic nuclei). The theoretical models (VENUS, HIJING, RQMD, and others) are implemented as Monte Carlo codes that describe the final state of each of the thousands of particles that are produced in these collisions to produce large samples of events. A simulation code called GEANT is used to propagate each of these thousands of particles through the material of the STAR detector and compute the reactions and energy deposition that occurs throughout the detector.

The CRAY T3E is a multi-processor supercomputer at NERSC at LBNL. STAR has generated a large set of simulated data on the CRAY T3E. During 1999 and about 1.2 Terabytes of simulated data consisting of 58,000 events for different generators and various detector geometries were produced. As can be seen in figure 1, STAR events are quite large, about 20MB each for the simulation. The Hijing and VENUS event generators were used. A range of impact parameters from central collisions to peripheral were used (0 - 12 fm) and beam energies of $\sqrt{s}$ = 100 and 200 AGeV. These data have been invaluable for understanding the detector response of STAR and developing analysis algorithms. They were essential as input for large scale Mock Data Challenges (MDC) at the RHIC Computing Facility at BNL, which is the computing facility where the STAR primary data will be stored and first analyzed. As a byproduct, mechanisms were developed to efficiently transport large volumes of STAR data over the network between computing facilities spread across the country, a capability that will be crucial for the distribution of real STAR data. As a result of these efforts, STAR is now confident that the first data can be reliably handled and efficiently processed to extract the physics.

Footnotes and References

*This work is carried out in conjunction with many members of the STAR collaboration. http://www.star.bnl.gov/.

† UCLA, LBNL

‡ LBNL

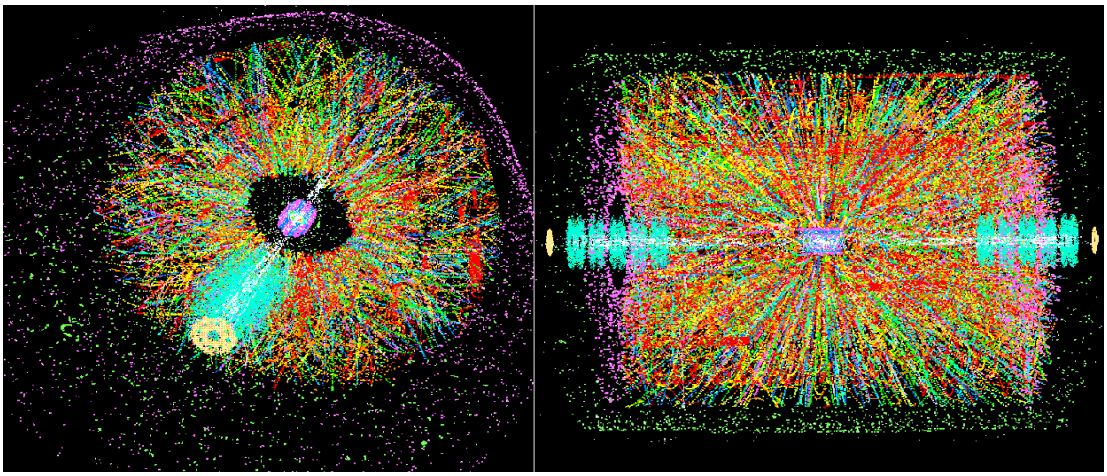

Fig. 1. An example of one of the simulated events showing hits of particles as they pass through the various subcomponents of the STAR detector.